

SHANNON AND SUCK RIVERS.

RETURN to an Order of the Honourable The House of Commons,
dated 15 May 1867 *1869*,

C O P Y

OF

REPORT OF MR. J. LYNAM

ON THE

RIVERS SHANNON AND SUCK.

Treasury Chancery, }
15 May 1867. }

GEORGE WARD HUNT.

(*Mr. Hunt.*)

Ordered, by The House of Commons, to be Printed,
15 May 1867.

SHANNON DRAINAGE.

LIST of MAPS furnished with REPORT, and deposited in the Library of the House of Commons for the use of Members.

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SHANTON DRAINAGE VALUATION, made in 1846. ESTIMATE for proposed WORKS, made in 1847. SUMMARY in LEVIES.

Levels of the River.	Area of Lands Damaged.			Estimated.		Total Area of Lands Damaged.		Present Value.		Estimated Increase of Annual Value by the Damages.		Cost of the Proposed Works.	
	Flooded September 1850.	Additional Flooded in Winter.	A. R. P.	A. R. P.	A. R. P.	A. R. P.	A. R. P.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	On the Small Scale. To prevent ordinary Annual Inundations.	On the Large Scale. To prevent extraordinary Annual Inundations.
Linsick to Cardisconall -	-	-	-	-	-	-	-	-	-	-	-	-	-
Cardisconall to Killakee -	641 1 20	472 2 0	1113 1 20	50 1 0	1163 1 20	1163 1 20	1,018 14 8	305 8 8	2,094 0 4	3,684 0 4	3,684 0 4	-	-
Killakee to Meelick -	4,074 0 23	948 2 21	5,022 2 44	820 2 23	5,842 4 67	5,842 4 67	3,250 16 4	1,471 12 6	9,655 15 -	95,042 5 -	95,042 5 -	-	-
Meelick to Athlone -	4,001 3 21	1,038 0 8	5,039 3 29	535 0 22	5,574 3 51	5,574 3 51	6,805 4 6	2,402 1 11	32,832 10 -	14,203 3 -	14,203 3 -	-	-
Athlone to Tinnaherry -	1,164 2 23	1,056 9 53	2,220 12 16	202 3 26	2,422 15 42	2,422 15 42	1,228 0 8	578 18 3	4,080 - -	4,080 - -	4,080 - -	-	-
Tinnaherry to Rosky -	786 0 0	- - -	786 0 0	82 2 0	868 2 0	868 2 0	656 14 0	170 16 3	1,840 - -	1,840 - -	1,840 - -	-	-
Rosky to Jamstown -	1,162 1 9	5 0 0	1,167 1 9	257 3 20	1,424 5 19	1,424 5 19	703 18 0	277 10 11	3,500 - -	3,500 - -	3,500 - -	-	-
Jamstown to Ballybridge -	883 2 10	140 1 10	1,023 3 20	269 0 10	1,292 3 30	1,292 3 30	922 18 6	334 9 -	4,524 - -	4,524 - -	4,524 - -	-	-
Ballybridge to Lough Allen -	509 3 0	- - -	509 3 0	89 0 0	598 3 0	598 3 0	499 17 0	503 8 0	4,143 - -	4,143 - -	4,143 - -	-	-
Lough Allen borders -	263 3 50	- - -	263 3 50	63 1 10	326 5 0	326 5 0	192 4 0	89 13 -	Letts acc. See per. 103, p. 25.	Letts acc. See per. 103, p. 25.	Letts acc. See per. 103, p. 25.	-	-
Total -	16,202 2 31	4,222 1 12	20,424 3 43	3,120 2 54	23,544 5 97	23,544 5 97	15,006 1 8	6,618 18 6	84,179 14 4	136,583 13 4	136,583 13 4	4	4
											Add for Castings, &c., 10 per Cent. -		
											8,417 10 5		
											145,000 13 9		
											TOTAL - - - £.		

REPORT to the Lords Commissioners of Her Majesty's Treasury, on the Means of Preventing the AUTUMN INUNDATIONS of the RIVER SHANNON, and of Improving the Outlet of the RIVER SUCK, by James Lynam, Esq., C.E.

To the Lords Commissioners of Her Majesty's Treasury.

Rahen Lodge, Ballinasloe,

25 April 1867.

May it please your Lordships,

1. In obedience to your Lordships' instructions, dated the 21st of May 1866, I have made surveys, plans, and sections of several narrow parts of the River Shannon, which plans and sections, with estimates, are forwarded with this report. The regime of the river, its inundations, their causes, their action on the adjacent low lands, and the means of preventing them, may be considered under three classes, viz. :

2. First.—*Saturation*, caused by small floods, and the remains of large floods slowly subsiding. These occur every year in spring, summer, and autumn. They may be wholly prevented by constructing regulating weirs, composed of a series of flood valves at the falls of the river, instead of the immovable stone weir-walls there at present.

3. Second.—*Great autumnal floods*, which inundate 16,299 acres of arable pasture and meadow land, and destroy great part of the crop, and injure the remainder.

In the 26 years since 1840, there occurred five great autumn floods, one in the middle of August (1861), one in September (1841), and three in October (1849, 1862, 1863). October floods are frequent, but August floods very rarely occur.

4. The August flood of 1861 was caused by an unusually wet season. According to the registry of rainfall kept at the Queen's College, Galway, by Dr. Arthur Hill Curtis, there fell in the month of July, $6\frac{1}{2}$ inches of rain, and from the 1st to the 12th of August four inches more. All the Shannon lakes were then filled to the level of the land, and some low meadows were covered by six or eight inches of water. On the 14th there fell one inch of rain, and on the 16th an inch; and the water went out over the lands. At the junction of the Suck River with the Shannon, the flood rose at the average rate of four inches a day for 10 days, from the 12th to the 22nd of August, when it was at the highest. The greatest rise in 24 hours was eight inches; the greatest depth on any considerable area of land was $3\frac{1}{2}$ feet, and the greater part of the flooded land was less than two feet under water. From these facts it appears that the Shannon floods are neither high nor sudden, compared with other great rivers; but they are very destructive. The area of land inundated in August 1861, as before stated, was 16,299 acres; and in addition to that, which was actually covered for 21 days, another large area adjoining, was greatly injured by saturation. The value of the damage done to the crops on the lands bordering the Shannon, exceeded 20,000 £, and the damage done to the crops on the lands bordering the River Suck and its tributaries exceeded 30,000 £.

5. Every summer and autumn the whole crop on at least 36,000 acres bordering the Shannon and the Suck is liable to be destroyed, and it is certain that every year a great deal of damage will be caused by small floods and by saturation.

6. Third.—*Great winter floods*, which occur every year, cover 20,825 acres of arable, meadow, and pasture land, and saturate 3,150 acres, thus damaging every year 23,945 acres of land in a distance of 150 miles of river Shannon extending through nine counties. The winter floods subside so slowly that the lands remain

main saturated during the greater part of the spring, which prevents the growth of good species of grass, and otherwise greatly injures the land. About 40,000 acres more are damaged by winter floods on the river Suck.

PROPOSED WORKS to carry off AUTUMN FLOODS.

7. To let off autumn floods of the magnitude of that which occurred in August 1861, and prevent inundations, I propose the following works:—

8. To construct regulating-weirs composed of moveable flood-valves at the falls of Killaloe, Meelick, Athlone, Tarmoharry, Rosky, and Jamestown, instead of the stone weir-walls there at present.

9. To dredge great portions of the channel, which are very much obstructed with mud, reeds, rushes, and other accumulations of aquatic plants.

10. To widen the river channel at Jamestown, Bishop's Islands, Derryholmes, Meelick, &c., to the extent shown on the accompanying maps and sections.

11. To deepen the channel at Killaloe to the extent shown on the accompanying maps and sections.

12. To embank the river through the low lands from below Killaloe to Castleconnell, and make back drains, syphons, and culverts to carry off the rain water and springs.

13. To improve the Rivers Camlin and Fallon above Tarmoharry, and make a sluice in the Cloondra mill-dam, and to alter the Cloondra lock gates so as to make them serve as a sluice, and to clear away the islands in the Shannon above Tarmoharry, as shown on maps Nos. 15 and 16.

14. To excavate the shoals at Drumherry and Inchanagowil so as to effectually drain the flooded lands above these obstructions.

15. The cost of these works, together with incidental expenses, as given in detail in the accompanying estimate, is:—

	£.	s.	d.
For works to carry off the ordinary autumn floods	92,507	13	9
For additional works to carry off extraordinary autumn floods	51,322	19	6
TOTAL - - - £.	143,920	13	3

SATURATION.

16. The height of water deemed necessary for steam navigation on the Shannon between Carrick-on-Shannon and Killaloe, 110 miles, is maintained in dry summer weather by six great stone weir-walls, in none of which is there any sluice or flood-gate to let off surplus water. Floods above these weirs subside very slowly. From the 1st of March to the 5th of April 1866 the remains of the previous winter flood subsided but three inches in the district above the great weir wall at Meelick, while all the lowest lands were covered by four or six inches of water, and very large areas were thoroughly saturated, as the Shannon water kept all the lateral streams and drains full to the level of the surface of the land. In June 1860, in September 1866, and almost every year small floods occur which cover the low portions of the lands, and saturate the remainder, rendering them unfit for pasture, and making it very difficult to get a hay crop dried.

17. The lands so much saturated yield a heavy crop of herbage, but it is very coarse, composed of sedges (*carexes*) yellow loosestrife (*lysimachia vulgaris*), in the lowest parts, buck bean (*menyanthes*); and on the best soils, immense quantities of meadow sweet (*spiraea ulmaria*), growing three feet high, and occupying nearly the whole surface of the land.

18. The portions of land 6 or 10 inches higher, and not so continuously saturated,

saturated, though inundated by high floods, are covered with a close clean crop of the best species of grasses; rye grass (*Lolium perenne*), fox tail (*Alopecurus pratensis*), meadow grass (*Poa pratensis*), and that best of horse hay, natural timothy grass (*Phleum nodosum*). Such meadows begin to grow a month earlier than the saturated grasses, are fit to be mown a month earlier, and may be saved and carried off to the haggard before the period of October floods. If those lands hitherto saturated for eight or nine months every year were relieved from such saturation, they would soon become as valuable as the slightly higher lands now are. This could be effectually done by means of the proposed regulating-weirs. The channel of the river is capable of carrying off the quantities of water passing on those occasions, if not so much obstructed by the stone weir-walls.

19. The natural fall of the river from Carrick-on-Shannon to Killaloe in such small floods is 37 feet 9 inches in 110 miles, or four inches per mile, and the following table shows how that fall is distributed:—

20.—

Names of Places.	Falls		Distances.	—
	In the River.	Over the Weirs.		
	<i>Ft. Ins.</i>	<i>Ft. Ins.</i>	<i>Miles.</i>	<i>Inches.</i>
From Carrick-on-Shannon to Jamestown Bridge.	0 9	- -	5½	1-64
Thence to Jamestown Weir - - -	1 0	- -	—	0-00
Fall over Jamestown Weir - - -	- -	2 4	—	—
Thence to Albert Lock - - -	1 11	- -	5½	0-33
Thence to the head of Rooksy Fall - -	0 2½	- -	7	0-00
Thence to Rooksy Weir - - -	0 6	- -	—	0-00
Fall over Rooksy Weir - - -	- -	1 0	—	—
From Rooksy Weir to Tarmaherry Weir -	2 6	- -	7½	0-00
Fall over Tarmaherry Weir - - -	- -	5 6	—	—
From Tarmaherry Weir to Lanesboro' -	1 2	- -	7½	0-07
Thence to Athlone, head of the Fall - -	0 3	- -	17½	0-17
Thence to the Weir - - -	0 4	- -	2	0-00
Fall over Athlone Weir - - -	- -	9 4	—	—
From Athlone Weir to the River Suck -	0 10½	- -	15	0-70
Thence to Banagher - - -	1 11½	- -	8	0-94
Thence to Counsellor's Ford - - -	0 9	- -	2	0-59
Thence to Meslick Weir - - -	1 1	- -	3	0-39
Fall over Meslick Navigation and Ed Weirs -	- -	6 8	—	—
From Meslick to Portlanna - - -	0 7	- -	3	0-87
Thence to Killaloe Pier Head - - -	0 5½	- -	23½	0-03
Thence to Killaloe Weir Head - - -	0 3	- -	—	18-60
Fall over Killaloe Weir, at the head, 2 ft. 6 ins.	- -	- -	- -	- -
Fall over Killaloe Weir, at the lower end, 3 ft. 3 ins.	- -	2 9	- -	- -
Thence to Killaloe Bridge - - -	1 1	- -	—	0-00
Additional fall at Tarmaherry, left out above to suit the heights of water there, 1 ft. 1 in.	—	—	—	—
Total - - -	15 9	21 0	111	

21. From these figures it is plain that during small floods more than half of the natural fall of the Shannon from Carrick-on-Shannon to Killaloe, 110 miles, is rendered useless by the stone weir-walls.

22. In the great flood of August 1861 the water fell after a few days to the level of the surface of the land, but remained at that height for 24 days in September. If it could have been let off to a foot lower, great part of the crops might have been saved during these 24 days; but it could not, as there were no sluices by which to utilize the falls at the weir-walls; another flood came in the end of September, which remained till the following spring, and the crops were all destroyed. During these 24 days while the crops of 16,000 acres of land were saturated in the waters of the Shannon, and rotting under the eyes of the owners, the river was from two to three feet higher than was warranted or wanted for steam navigation: more than half of the natural fall of the river was rendered useless by, and wasted in, cascades over the weir-walls, and those weirs were the only obstructions preventing the subsidence of the surplus waters.

REGULATING WEIRS.

23. The regulating weirs I propose, when erected, will render it easy to utilize great part of these cascades without injuriously affecting the navigation. They will be made so strong as to bear five times the greatest pressure that they may be subject to from the water above, and the flood valves will be so balanced, that (if not self-acting) they may be opened and closed with ease. In summer they will be closed, and will maintain with certainty the proper level of the water for navigation. In ordinary wet weather they will be opened more or less, as may be necessary, to let off the surplus water, and keep the surface of the river and its 66,000 acres of lakes down to the navigation level, which is from two to three feet under the surface of the land. By their action the following very useful objects would be accomplished.

24. First.—The remains of great floods would be let off the lands in a few days, either in spring or autumn.

25. Second.—Small floods, which often occur in summer and autumn, would be let off to the sea without doing any injury, and thus all the evils of prolonged saturation of the land would be prevented, which would effect a valuable improvement.

26. Third.—The immense reservoirs naturally afforded by the 66,000 acres of the Shannon lakes would be kept available to receive and retain the influx of sudden rains; this would aid materially in preventing inundations of the land.

27. The capacity of reservoir that may be so prepared is 6,000 millions of cubic feet, and it would have been capable of retaining one-third of the great flood of August 1861 for 15 days, while the other two-thirds would have been passing off at Killaloe, and at the end of those 15 days, the quantity of water passing in the Shannon had actually diminished by one-third; so that if the river channel had been capable of carrying merely two-thirds of the maximum quantity of that flood, the reservoirs in the lakes would have prevented an immense amount of the damage done by that inundation. But that reservoir was not then available. The loughs were filled to the brim by the four inches of rain that had fallen between the 1st and the 12th of August, and the two other falls that occurred on the 14th and 16th, amounting to two inches, caused all the destruction of property.

28. The navigation will not be injuriously affected by the regulating weirs. At Killaloe there is, under present circumstances, a very rapid current which causes much trouble in floods. In winter the fall in the navigation course there is 1 ft. 8 ins. in 2,000 feet. I propose to replace the bank that formerly protected that part of the sailing course, and thus restore a nearly still-water channel. This will render the navigation at Killaloe far better than it has hitherto been.

29. At Meelick also there is in high floods a great current in the new sailing course, but there the old canal is still available, and by it the steamers go up in times of flood, and thus avoid the current in the new navigation. The old canal is foul with weeds, and in some places with gravel, but it may and ought to be dredged. There is a short bend called the elbow in this sailing course, which

has

has long been complained of. I propose that it shall be improved. The old lock, called Hamilton's lock, is quite capable of passing the new and improved steamers that do the Shannon trade; in fact, they do the trade in winter through that lock, and there will be six feet of water on both sills at all times, when it would be necessary to open the regulating-weir. No inconvenience to the navigation can occur from the operation of these weirs at or above Athlone.

30. If at any time when these weirs would be open it might be found necessary to close them for one or two hours, they could be easily closed in a few minutes, and opened again when the exigency would have ceased. The water accumulated above them, when closed, could (for one or two hours out of 24) cause no material damage. At Meelick, it rarely happens that more than two steamers pass in one day, and none ever pass at night. Above Athlone no more than two steamers pass in a month.

31. There is at present a trustworthy man stationed at each fall of the Shannon, who has a house and a salary as lock-keeper. The time of those men is very little occupied, as there is so very little trade. Each of these men could attend to the regulating-weir. It may be made to open and close by self-action, as the water above will rise or fall from the level fixed on, but it will be necessary to place it in the care of a proper person, and the lock-keepers are available for the purpose.

32. Whatever plan may be at any time authorized for preventing the Shannon inundations, regulating weirs, composed of powerful sluices, or flood valves, must be the principal part of it. They will let off more flood-water and do more to improve the land, and prevent injury to the crops, in proportion to their cost, than any amount of excavation can effect, compared with its cost. They will do a great amount of good, without any more excavation than would be necessary to place them at the proper depth. By keeping the water low in small floods, &c., they would render excavations in the river channel more economically done. It has often been stated officially that there is no fall to give these regulating weirs any useful effect; but it is plain from the table, page 7, that there is in small floods a valuable fall. I am prepared to prove before a referee, all that is here stated in favour of their beneficial action. There are different patterns of regulating-weirs in use in Ireland, England, France, and America, even the best of which is most probably capable of being improved to suit the River Shannon. I beg leave, therefore, to propose that two or more patterns of sluices be selected from among those already known, and constructed in one of the Shannon weir-walls early next summer as an experiment. By observing their action and results, a pattern suitable for the Shannon could be found with certainty. The expense of constructing these experimental flood-gates would not exceed 300 £.

STEAM DREDGING.

33. Two efficient steam dredgers, the property of the Board of Works, are lying idle on the Shannon; I propose that these steam dredgers with proper crews, barges, and barge gangs, be kept constantly at work for some years.

34. The channel of the Shannon is very much obstructed with reeds (*Arundo Phragmites*), bulrushes (*Scirpus lacustris*), and horsetail (*Equisetum fluviatile*), which grow in such close masses that no water runs through them. In some places they occupy margins 40 feet broad on each side of the river for miles. The margins on which they grow are soft clayey banks, about three feet deep under the water in summer, and six feet deep in winter. I propose to have all these banks dredged out, and thus, for a moderate cost, materially enlarge the channel.

35. There are along the river several still bays, and half-closed old branches, in which to deposit the stuff so dredged.

36. The very curious foreign plant, called by botanists the *Anacharis Aleynastrum*, is extending its growth to a wonderful extent. Everywhere in the still parts of the Shannon it was to be seen last summer and autumn growing in dense masses from the bottom several feet high; and when the water fell in

August, immense meadows of it appeared over the surface. It was impossible to pull a boat through it. Great quantities of it are torn from the bottom in rough weather, and it is dragged out of the canals by men. It is a very good manure for cabbage, potatoes, &c. It belongs to the family of plants *Hydrocharitacea*, or water-soldiers. Last autumn its very pretty blue flowers were abundant, floating on the Shannon, attached to long, white, threadlike foot-stalks. If the growth of this plant should extend for two or three years more as much as it has extended during the last three years, it will occupy a large proportion of the channel, and materially tend to increase the autumn inundations.

OUTLET FOR THE RIVER SUCK.

37. Your Lordships have ordered that the design for the enlargement of the channel of the River Shannon below the mouth of the River Suck, should be on a scale to render it capable of carrying off not only the autumn floods, such as have hitherto occurred, but also the greater autumn floods that may be expected when the River Suck will have been so far improved as to carry off all the rain and spring-floods of its basin direct to the Shannon, without flooding any of the adjacent lands. It appears from the maps and sections of the River Suck district, which are preserved in the Office of Public Works, that the area of lands bordering the Suck, which are generally inundated, is 14,000 acres, generally covered on an average by two feet of water. The area of land inundated by the streams tributary to the Suck, is 6,000 acres, which are covered on an average one foot deep. On these data, and the rate and quantity of rise of the water, as well as it can be ascertained, I have made a calculation to find at what period of the flood of August 1861, the floods of the Shannon at Binnagher, Meelick, and Killaloe, would have been increased, and by what quantity they would have been increased if the River Suck and its tributary streams had then carried off all the flood-water direct to the Shannon without spreading over any land. I have made another calculation of the same nature for the 16,299 acres of lands flooded by the Shannon, at the same time, and which will not be flooded when the Shannon will be improved. The whole of the lands hitherto flooded in autumn by the Shannon, the Suck, and tributary streams, amounting to about 36,000 acres, covered by from four feet to one foot of water, has served as immense reservoirs, and have retarded considerably the flow of flood-waters towards the sea. To prevent all autumn inundations of these lands is to destroy all that immense extent of reservoir, and let all the hitherto reserved water flow direct to the sea. In compensation for that loss there are the great Shannon lakes with an aggregate area of 66,000 acres, which may be utilized by means of the proposed regulating weirs as before described. Hitherto the lakes have not been useful in autumn as reservoirs. On all occasions of inundations the lakes had been previously filled to the brim by previous rains. Such was the case on the 12th of August 1861. On the 25th of last September they were all full to the brim, and if any heavy rain-fall had occurred after the 26th of September last, causing a rise of eight or nine inches in the Shannon, the crops on 13,000 acres would have been covered by water. When the channel will have been improved, as now proposed, and the regulating weirs in action, the surface of those lakes may be kept down to the navigation level in all but very wet weather. Then if a sudden fall should occur, those great reservoirs will be available in lieu of the lands hitherto inundated. Having balanced the whole capacity of the reservoir to be destroyed against the capacity of reservoir to be provided, there appears to be a loss of reservoir by the proposed improvements amounting, to 2,344 millions of cubic feet at Meelick, and 2,607 millions at Killaloe. This results from the immense amount of reservoir in the 20,000 acres of flooded lands of the Suck. The effects of this loss of reservoir would be that the floods in the Shannon below the Suck would in future rise faster than hitherto. Each day from the commencement of the flood a portion of the hitherto reserved water would enter the Shannon in addition to the usual quantity, and pass away. At the mouth of the Suck the flood of August 1861 was 11 days rising (from the 11th to the 22nd), when it was at its highest level, and had covered the 36,000 acres on Shannon and Suck. It then began to fall at the rate of 24 ins. a day for 13 days, to the 4th of September, when it was off all but the lowest lands. If no
lands

lands had been flooded, the highest water would have been four days earlier and would have been 9 to 12 inches higher than it was under the existing state of the river, or the junction of the Suck and the Shannon.

38. The maximum quantity of water to pass off in the Shannon, when the waters of the Suck will have been regulated, will not exceed the maximum quantity hitherto occurring under similar rainfalls, by so large a proportion as might be at first supposed from seeing the great quantity of reservoir on the flooded lands to be relieved. The largest daily increase in the Shannon river channel from these causes will occur before the Shannon itself will have risen to its maximum.

39. The quantity which passed over Meelick Weir on the 22nd August 1861, calculated by the most approved rule, was 550,000 cubic feet per minute. From the calculations which I have made it appears that the greatest quantity, after the proposed improvements will have been effected, with rainfalls similar to that of August 1861, would be 700,000 cubic feet per minute. The channels I have designed will carry that quantity at a level six inches under the lowest land, and 12 inches under the great flats. If the quantity should reach 800,000 cubic feet per minute it can be but for three or four days, and even then only a small area of the lowest land will be saturated, not flooded. On the 10th day after the maximum, the quantity of water passing would have fallen to 602,000 cubic feet per minute, which would pass with the proposed channel and sluices at a level of 12 inches under the surface of the lowest land, and 18 inches under the great plains of meadow land.

40. The flood of August 1861 was an extraordinarily great one as an autumn flood, and judging from the records of floods for many years back, it may be concluded that so large a flood will not occur in August or September more than once in 20 or 30 years; and here arises an important question, whether it would be more discreet, under present circumstances, to expend the very large sum necessary for enlarging the channel sufficiently to carry off the quantity of flood-water passing in such extraordinary autumn floods, which occur but once in 20 or 30 years, and then last for but 12 days, or to enlarge the channel merely sufficient to carry off ordinary autumn floods, which can be done for a considerably lesser sum. In view of this important question, I have made two estimates; one for improving the channel of the river, so that it will carry off ordinary autumn floods without inundating any but a few acres of very low margins of land, which is 92,597 *l.* 13 *s.* 9 *d.*; another estimate for improving the channel, so that it will carry off extraordinary autumn floods, which amounts to 143,920 *l.* 13 *s.* 3 *d.*

41. The extent of the works for the latter, or large scale plan, are delineated on the maps now forwarded to your Lordships.

CASTLECONNELL AND KILLALOE DISTRICT.

42. From the Worldsend Weir to O'Brien's Bridge	-	-	2 miles.
Thence to Parteen Ford	-	-	1½ "
Thence to Cussane Lock	-	-	1½ "
Thence to Killaloe Bridge	-	-	2 "
TOTAL length to Killaloe Bridge			7 miles.

	A.	R.	P.
The area of land liable to autumn floods is	641	1	20
The area of land in addition, liable to winter floods is	472	2	0
The area of land liable to saturation is	36	1	0
TOTAL area of land liable to be damaged in this level	1,150	0	20

The estimated increase in the annual value of these lands that would be caused by relieving them from floods is, 295 *l.* 8 *s.* 8 *d.*

The estimated cost of the proposed works is, 3,984 *l.* 9 *s.* 4 *d.*

298.

B 2

43. The

43. The Parliamentary height of the water for navigation on the upper sill of Errins, and on the lower sill of Cusane Lock, is six feet, but it falls to $5\frac{1}{2}$ feet by leakage through the weir at Castleconnell, and it rises every year above 13 feet, and in 1857 reached 17 feet, which is 11 feet above the navigation minimum level. Autumn floods covered these lands eight years out of the 30 years, as follows, since the year 1836, inclusive.

1836	-	27th October and succeeding days, slightly.
1839	-	16th September, and remained on the lands till the following March.
1841	-	16th October, remained all the winter.
1843	-	4th June to 18th June only; no flood in autumn.
1849	-	25th October; remained till the following spring.
1861	-	20th August; destroyed the crop.
1862	-	26th October, remained all the winter.
1863	-	8th October, remained shallow.

44. In August 1861 it rose to 13 ft. 6 in. The level of the lower callow lands (excepting a few very low margins) is 11 feet over the same lock sills, so that the flood of August went out over those lands on the 15th and covered them $2\frac{1}{2}$ feet deep on the 23rd, disappeared on the 5th of September, and remained three inches to six inches under the surface till the 25th of September, when there fell one and $\frac{1}{10}$ inch of rain; the flood again went out on the meadows, and remained till the following spring. Most part of the meadow was of the very best quality, worth 6 l. an Irish acre, but it was all very much damaged. The falls of the river surface were then as follows:

In the general river	18 $\frac{1}{2}$ inches in six miles, or three	
inches per mile	- - - - -	18 $\frac{1}{2}$ inches
At Parteen Shoal	- - - - -	3 "
At O'Brien's Bridge	{in the narrow arches six inches in the broad arches three inches}	mean 4 "
Over the weir at Worldsend	- - - - -	9 "
Total fall to the tail of the weir	- - - - -	34 $\frac{1}{2}$ inches
Fall in the next 500 yards	- - - - -	<i>Ft. in.</i> 2 0
Fall in - - 400 yards further	- - - - -	2 3
Fall in - - 900 yards	- - - - -	4 3

45. To prevent injury from such floods as that of August 1861, the water should be kept down to 10 ft. 6 in. on the Cusane lock gauge, that is, six inches under the surface of the meadows, and three feet under what it was in August 1861. To accomplish this, the water on the upper side of Worldsend weir should be lowered four feet under what it was in August 1861, and that level can be got at the distance of 900 yards below the weir, as I have ascertained, by taking the levels of the surface of the flood-water.

46. To lower the flood-water by deepening the bed of the river, would require to excavate 90,000 cubic yards at the weir, nearly all of which is limestone rock; also to erect a regulating-weir 400 feet long; and to improve the waterway at O'Brien's Bridge, the cost of which would exceed 20,000 l., whereas the profit to be derived is estimated at but 295 l. per annum.

EMBANKMENTS.

47. The nature of the land on both sides of the river is remarkably favourable for constructing protective embankments. On the Clare side, the towing-path of the navigation (which autumn floods never cross), extending for four miles, may be at once used as a permanent protecting embankment by building up a few arches under it. From the canal to the weir on that side, the greater part of the natural bank of the river is so high that no autumn flood ever crosses it, and there remains but 136 yards of embankment to be made along the river on the Clare side, and that will never have to bear a pressure of more than three feet deep of water. On the Tipperary and Limerick side of the river also there runs a natural ridge of land by the river for two miles out of 4 $\frac{1}{2}$ miles,

miles, so that it is necessary to make but 2 $\frac{1}{2}$ miles of embankment on that side, none of which will have to bear more than three feet deep of water. There are no sand beds and no dangers of leakage under the embankments. The rain-water and springs from the surrounding high lands may be very easily taken up by small catch drains. The streams coming in are very small, not more than four feet broad: the channels can be cleaned and widened, and the removed clay formed into embankments to carry the water to those streams and the drainage of the surrounding high lands into the Shannon at a level in autumn floods of 1 $\frac{1}{2}$ feet to 2 $\frac{1}{2}$ feet over the surface of the land.

48. The owner of the largest area of these lands (and the best of them), Mr. George Twiss, of Bird Hill, has formally stated that the landowners wish to retain the winter floods to manure the meadows.

For this purpose sluices must be constructed in the embankments to let in the water when the crops will have been removed each year.

THE OUTLET FOR BACKWATER.

49. An outlet for the surplus rain-water of the meadow lands must be provided. For the flooded lands of Lackagh, Portcrusha, and Montpelier, in the county of Limerick, this may be easily done by constructing a pipe or small culvert under the river bank at the end of the weir wall, and onwards a distance of 800 yards, to a point where the surface of the flood water is 4 $\frac{1}{2}$ feet lower than the lowest land, one mile and a half upwards, giving a fall of three feet per mile for draining the surplus rain-water of 238 acres of land of an alluvial loamy soil.

50. The surplus rain-water of the flooded land of Errina townland (66 acres), in the county of Clare, may be easily let off by a pipe under the bank of the river, 500 yards long, on the Clare side.

51. The outlet for the remaining lands is at Errina double lock, where there is a fall in mid-flood of 18 feet. From the low water at the tail of that lock a pipe may be built in the slope of the canal for 1,800 yards upwards, to the back drain of the present towing-path in the flooded lands. When the surplus rain-water of the low land will rise to within three feet of the grass, it will pass off through this pipe; another pipe or culvert, 900 yards long, must be made, to connect the two separated parts of the towing-path back drain at O'Brien's Bridge.

52. These works, together with building up the few arches now open under the towing-path, will effectually protect the low lands in the county of Clare up to Cussane Lock, 239 acres.

53. For the Bird Hill and Pollagh Meadows, 387 acres, a syphon 120 yards long must be made under the Shannon on Parteen shoal, to carry off the surplus rain-water and soakage, if any, into the towing-path back drain, whence it will pass off by that drain and the pipe before described to the low water at the tail of Errina Lock. The fall for this drainage will be 16 feet in four miles, or four feet per mile to carry off the surplus rain-water and soakage, if any, from 626 acres of deep alluvial loamy soil during the months of autumn only. The winter floods may be left on the Bird Hill and Pollagh lands by shutting that end of the syphon, and opening sluices, which should be provided in the embankment, to let in the Shannon water. The owners of the Clare and Limerick low lands may admit or keep out the winter floods at pleasure. Some improvement must be made in the drain below Errina Lock, to pass off the additional water proposed to be sent there. A piece of land 134 acres, in the townland of Moys, above Cussane Lock, will remain unprotected; also in the townlands of Ballina, Roolagh, Garrynatinal, and Cooldorroy, four acres will remain liable to autumn floods, and 58 acres liable to winter floods. The cost of protecting these lands would far exceed their fee-simple value. The island of Inishlisky, 21 $\frac{1}{2}$ acres, will also remain unprotected.

54. A cheaper means of removing the surplus rain-water and springs from the lands above O'Brien's Bridge would be by steam pumping engines. One engine of six-horse power, placed near Parteen shoal, would effectually drain

the 387 acres of land on that side of the river, and one of four-horse power would drain the 157 acres of land above that village in the county of Clare. The lift for the water would never exceed in autumn five feet to pump the drainage of the low lands into the Shannon. The cost of two steam engines and pumps, with the engine house and turf house, would be 750 £.

THE KILLALOE AND MEELICK DISTRICT.

23 miles of broad deep lake.

9½ miles of broad deep river.

¼ mile of broad river, 7½ feet deep in summer.

55. Besides the flooded lands bordering the Shannon for 31 miles from Killaloe to Meelick, large tracts of land on this level are flooded up each of the following rivers:—

The Searriff, the Woodford, the Cappagh, the Ballyshrule, the Boulia, the Nenagh, and the Little Brosna.

The area of lands liable to autumn inundations is	-	-	4,074	acres
The additional area liable to winter floods is	-	-	989½	„
The additional area saturated every winter is	-	-	820½	„
Total area of lands injured in this level is	-	-	5,884	acres.

	£.	s.	d.
The estimated increase in the annual value of these lands, by relieving them from injurious floods, is	-	-	1,471 - -
The estimated cost of works to prevent ordinary autumn floods is	-	-	9,555 15 -
And to prevent extraordinary autumn inundations	-	20,942	5 -

56. This district would be better circumstanced than any other on the Shannon by having within it the immense natural reservoir of Lough Derg, containing with the connecting rivers 30,000 acres, if that lake were utilized as a reservoir.

The Parliamentary level of the lake for navigation is 3 feet 3 inches under the surface of the lowest land, which, on the 30,000 acres, gives a reservoir of 4,247 millions of cubic feet, which would have retained one-third of the destructive flood of August 1861 for 11 days, while the other two-thirds would have been passing off at Killaloe.

But that reservoir was not then available; it had been filled to the brim by the rain-falls on the 1st, 4th, 7th, 9th, and 11th of August, and when another rain-fall came on the 14th, the flood went over the lands. Another great fall occurred on the 16th, and the 4,074 acres were covered with water on the 18th. If floods of that magnitude were reduced or lowered two feet at Portumna Bridge, and 2½ feet at Meelick, no land would be flooded. The fall as a cascade over the weir-wall at Killaloe, in floods of that magnitude, is as follows:—

At the upper end of the weir	-	-	-	1 ft. 11 inches.
At the lower end of the weir	-	-	-	2 „ 3 „
Mean fall	-	-	-	2 „ 2 „

Which is very nearly the amount of fall required.

57. In such floods there is on all the shoals and lock-sills more than nine feet of water, that is three feet more than is either warranted or wanted for steam navigation; therefore, if the Killaloe weir-wall were totally removed from the river in such floods, there would still be seven feet of water on all the shoals and lock sills; and allowing for loss of fall (by lowering the surface of the current from the weir to the lake), there would be 1 foot 6 inches less water on the meadows at Portumna. Evidently what is required here is a weir that will retain with certainty the proper height of water for navigation in dry summer weather, and that may be moved as much as possible out of the water-way in floods, and leave the least possible obstruction; a weir with the largest practicable

practicable valves, and the thinnest practicable supporting piers. Such a weir may be constructed so that when open to its fullest extent it will occupy no more than three inches of fall, instead of 2 feet 2 inches of fall occupied by the present stone weir wall, and such a weir would, by having its action well regulated, let off all small floods without injury to the land, and prevent injurious saturation. I therefore propose to construct a regulating weir composed of a line of flood-gates 420 feet long directly across the channel, and to remove the present weir-wall. Also to restore the canal banks so as to protect the navigation from the pier head to the lock, and to dredge the channel as far as practicable above the weir for a length of 200 yards.

58. To carry off extraordinary floods it is necessary to deepen the channel, as shown on the map, and to underpin the piers of seven arches of the bridge.

THE PARLIAMENTARY LEVEL OF THE SHANNON.

59. On the 18th of October 1831, the Chief Secretary of State for Ireland, now Prime Minister of England, wrote from the Irish Office, London, to Colonel John F. Burgoyne as follows, relative to the River Shannon: "It is thought desirable by the Government that your inquiries should take a wider range, and should take within their scope the benefits which might be expected to result from a judicious expenditure of capital upon the River Shannon, both with reference to the improvement of its navigation, and also to the reclaiming of vast tracts of land now either inundated periodically by the floods of that river and its tributary streams, or rendered permanently incapable of cultivation from the accumulation of waters which are unable to find a vent, &c." "You will, after full consideration of the documents already in existence, and after personal inspection, report your opinion of the practicability and advantage of establishing such a control over the occasional floodings of the Shannon as may tend to a beneficial drainage and reclaiming of the bogs and low lands through which it passes."

60. In accordance with the instructions in that letter, Colonel Burgoyne wrote detailed instructions, dated 10th November 1831, to Thomas Rhodes, Esq., C.R., in which he stated, among other things, "It is evident that the great key to any system of drainage must be at the falls of Killaloe." Mr. Rhodes made a detailed and accurate survey of that part of the Shannon in 1832. This report, with maps and sections, were printed by Order of the House of Commons in August 1832, page 731. He proposed to construct a weir at Killaloe, "this weir to be made of such height as to retain in the driest seasons six feet of water upon the sill of Killaloe Lock" (see Mr. Rhodes' second report, page 64; third report, page 13, and drawings, No. 42), which show the height proposed for the weir at Killaloe, viz., 5 feet 8 inches, allowing four inches deep of water to be passing over in driest summers. Subsequently the Act 5 & 6 Will. 4, c. 67, was passed, and five Commissioners were appointed under its provisions.

61. That Act provided amongst other matters that the Commissioners "shall make out a plan and estimate, with proper plans, maps, drawings and sections, and elevations thereto attached, and describing the said navigation, and the works proper in their judgment to be executed for the clearing and improving of the same, and for confining the waters thereof, and preventing the inundations of the contiguous lands." The five Commissioners appointed under that Act made another survey of the Shannon.

Their second report with the maps, &c., was presented to both Houses of Parliament by command of Her Majesty, and printed in 1837.

62. In their report and plans they "determined, after mature consideration, to adopt the general principle suggested by Mr. Rhodes." On their drawing, No. 39, is shown the proper level they proposed for the navigation of Lough Derg, viz., six feet over the sill of Killaloe Lock, the same as proposed by Mr. Rhodes.

63. Notwithstanding all this it is a fact that the weir has been built, part 6 feet 9 inches high, part seven feet high, which prevents the water from ever sinking below seven feet on the sill, and in ordinary wet weather throws six
298. inches

inches of water out over thousands of acres of land, which land would be six inches over water if this weir were only the proper height.

64. Another important fact is to be noticed here. The widening and deepening of the channel at Killaloe has not been completed either to the breadth or depth delineated on the Parliamentary maps; a breadth of 100 feet on the Tipperary side remains there still not cut away, and a depth of six feet remains in the bottom towards the same side not yet excavated. I have ascertained this fact by comparing the map and sections I have recently made of the river, with the map and sections made by the five Commissioners in 1837, and then presented to your Lordships, and subsequently printed by Order of Parliament.

65. If the channel had been excavated to the extent shown on the maps, as was ordered by the Act 2 & 3 Vict. c. 61, s. 1, an immense amount of damage by floods in this division would have been prevented. The far greater part of the crop destroyed in 1861 was covered by no more than one foot of water.

66. The narrowness and shallowness of the channel at those unfinished excavations, together with the extra height put on the weir wall, caused 1 ft. 3 in. of a rise of the flood.

67. Nearly every year small floods occur in summer and autumn, which cover the meadows five to eight inches deep, and do much harm. If the works at Killaloe were finished according to the Parliamentary plans, the water on all such occasions would be six inches under the surface of those lands.

68. In the destructive flood of August 1861, the water was for 24 days in September even with the surface of the land, and kept the hay so saturated that it could not be dried. If the Killaloe Weir were no more than the proper height, the water would have been, during those 24 days, 9 to 12 inches under the surface of the land.

69. It is now necessary to set forth fully and accurately how the navigation, as it at present exists, would be affected if the level of Lough Derg were lowered in dry summer weather to the Parliamentary level.

70. The canal from Killaloe for one mile down to Moys Lock would be too shallow, in consequence of the accumulation of mud and weeds; it may be easily dredged. The little harbour at Drumineer would be shallow, as it is being filled with gravel; it may be easily deepened. There are but two shoals in the 31 miles of sailing course between Killaloe and Meelick, Derry Shoal and White's Ford; on each of these there would be six feet of water. There are five lock sills to be affected. On Moys Lock, upper sill, and on both sills of Killaloe Lock, there would be six feet of water, as proposed by the Commissioners. On the lower sill of Victoria Lock there would be 5 ft. 3 in. By the Parliamentary plans, this sill should be on the same level as the sill of Killaloe Lock, but it is nine inches higher. This was a great mistake in building that lock, but as the improved steam vessels which do the Shannon trade draw but 4½ feet of water when laden and going slowly, they may safely pass with 5 ft. 3 in. on the sill. On the lower sill of Hamilton's Lock there would be but 3½ feet of water, but that lock is never required until the Shannon rises to near the level of the land, viz. 9 ft. 3 in. on Victoria Lock, lower sill, and then it would have 7½ feet of water.

71. It is important to remember that this reduction of level is required only during the driest and furthest weather; the quantity of water passing in the Shannon in winter and in spring would be so great that it could not be kept so low. The object of having the water at that low level in dry summer and autumn weather, is to maintain the greatest possible capacity of the reservoir in Lough Derg to receive and retain part of sudden floods, while the rest would be passing to the sea. The additional foot of depth of the surface of Lough Derg guaranteed by the reports and plans of the five Commissioners, and by the Act of Parliament, would make on the 30,000 acres of water 1,306,000,000 cube feet, which would retain one-third of a great flood for 3½ days, while the other two-thirds would be passing away. This would materially help to prevent inundations of the land, both on this level and on the two lower levels towards Castleconnell and Limerick.

72. I therefore

72. I therefore beg leave to recommend that the summer water may be reduced to the level proposed and recommended by the five Commissioners, delineated on Drawing No. 39, in their second Report, and sanctioned and published by Parliament in 1837, viz., six feet over the upper sill of Killaloe Lock.

73. The Little Brosna River enters the Shannon in this district just below the Victoria Lock. The lower part of this tributary is very deep for 1½ mile, but the upper part is shallow and crooked, and floods some good land for three miles further upwards. It will be necessary to improve the channel of this river, at a cost of 840 l.

The Lismagh River, which enters the Shannon just below Banagher, is affected by the Shannon floods for 4½ miles, and will require to be improved so far. An item for this is inserted in the Estimate of Works for the district from Meelick to Athlone.

THE DIVISION FROM MEELICK TO ATHLONE.

27 Miles, all River.

74. This is the most important division of the Shannon, having the greatest area of flooded lands, the greatest obstructions in the river, and the worst outlet.

The area of land liable to autumn inundations is - - - 6,692 acres.

The additional area liable to winter floods is - - - 1,352 „

The additional area saturated is - - - 936 „

Total area of land injured in this level - - - 8,880 acres.

75. The Parliamentary height of the water, as delineated on the Parliamentary maps, is six feet over the upper sill of Hamilton's Lock in the old canal at Meelick, but the water falls in very dry summers to 5 ft. 5 in., and rises in floods to 10 ft. 10 in. at that lock, and to 16 ft. 4 in. just below Athlone Weir. The great flood of August 1861 was 11 days rising from the level of the lowest lands to its greatest height. The greatest rise in 24 hours at the mouth of the Suck was eight inches. The greatest depth of water on any land was 3 ft. 6 in. near Athlone, but the greater part of the land was no more than two feet under water. The falls of the surface of the water were then as follows:—

Reaches.	Falls.	Distance in Miles.	Fall per Mile.
	Feet. in.		Inches.
From Athlone to the mouth of the Suck -	1 5	16	1'11
Thence to Shannon Harbour - - -	2 1	6	0'13
Thence to Banagher - - - - -	0 7	2	0'50
Thence to Carrullisched - - - -	1 2	2'25	0'02
Thence to Meelick Weir - - - -	3 0	1'00	10'00
		27'16	
Fall over the Navigation and Ed Weirs -	4 9		
Fall between those Weirs - - - -	0 4	0'50	5'00
	12 4		

76. The great surface fall of the stream from Counsellorswood to Meelick Weir shows how small the water-way is there; at one place it is but 250 feet broad at bottom, and eight feet deep in summer. In other places it is but 300 feet broad, and though 400 feet broad in other parts it is there so much choked by thickly-growing masses of reeds and rushes, which grow six feet over water, that there is little better water-way than in the narrow parts. In the natural state of the Shannon there was a second branch of the river between those places, about 250 feet broad, which carried about one-third part of the

flood-water. That channel was stopped by the Shannon Commissioners when improving the river, and it is lost to the drainage. Mr. Rhodes, in the report which he made in 1832, under the directions contained in the then Lord Stanley's letter of the 18th October 1831, proposed to widen one channel to double its sectional area, in order to compensate for the shutting up of the second channel. The five Commissioners, under the Act 5 & 6 Vict. c. 61, proposed the same widening, and delineated it on their map, No. 42, as published by order of Parliament, and they purchased and paid for the land to be cut away. The land remains still not cut away; the river channel is not widened though the second channel is shut up by large embankments. One of those embankments made across the second channel at Kiltuscariff Mill is so irritating a grievance that I must beg leave to solicit attention to it. It is not a part of the plan for the improvement of the Shannon, as drawn up by the five Commissioners, and laid before your Lordships. It is not marked on their plans nor mentioned in their reports; it is of no use whatever to the navigation; it is the sole cause of inundating every year one of the best fattening farms in Ireland. On the 22nd of June 1860, I inspected the place professionally for the lessee of the farm; I saw the flood-water over the grass, but only four to six inches deep, and on going to the other side I saw that the dam or stank was the sole obstruction to the flow of the flood-water; the water on the down-stream side of the dam was five feet lower than on the up-stream side. This led me to read the Shannon Commission Reports, and to examine the Shannon works, and to draw up a memorial pointing out the causes of the inundations, and the means of lessening their duration and extent. That memorial was signed by many landowners, and forwarded to the Lords Commissioners of Her Majesty's Treasury in December 1860, and printed with other papers, on the motion of Colonel French, in June 1861. An immense flood occurred on the following August, which destroyed all the crops on the 16,000 acres of lowlands bordering the Shannon, and all I had set forth in the memorial was proved to be true.

77. Besides the great destruction of crops by occasional great autumn floods, much injury results from long-continued saturation as before described. An instance of this and of the effect of the sluices in preventing it, was observed last year. From the 1st March to the 5th April 1866, an immense area of land was saturated, and some covered by three to six inches of water, the water subsiding only at the rate of three inches in 36 days. The two sluices of the Victoria Lock were then left open day and night at my request, and in three days the water subsided so far as to leave all the lands dry. The difference of level of the water above and below the sluices was then seven feet. The dimensions of the sluices are about two feet by two feet, and they are much curved in a tunnel through the mason-work of the lock. From this it may be concluded that sluices in the weir wall six feet deep, and amounting to 150 feet in length across the river, with the fall of six feet available there in the middle of great floods, would be of immense value.

78. Two great tributaries join the Shannon in this district. The Brosna, with a rain-basin of 389,000 acres, has been improved under the Arterial Drainage Acts, at a cost of 107,022 £, and all its waters, which formerly flooded 10,000 acres of land, now come down direct to the Shannon. The River Suck, whose basin is 400,000 acres, inundates 20,000 acres of land every year. Your Lordships have ordered that the improvements to be designed for the Shannon shall be sufficient to give an outlet to the floods of the Suck, in order that the drainage of the lands flooded by the Suck may be carried on concurrently with the improvement of the Shannon. This was recommended by the Committee of the House of Lords in 1865, and prayed for by the landowners in a memorial presented to his Excellency the Lord Lieutenant of Ireland on the 13th of March last.

79. The effects produced in the lower reaches of a river by draining the previously flooded lands in the upper reaches, or those bordering great tributaries, are not yet fully understood or agreed on by engineers; and it is reported to have been said by a high authority, that the freeing of the lands bordering the Suck from floods would not injuriously affect the lands on the lower reaches of the Shannon. In the flood of August 1861, there were about

14,000

14,000 acres of land bordering the Suck River covered, on an average, about two feet deep, and 6,000 acres bordering the streams tributary to the Suck were covered, on an average, one foot deep; the depths of water on these lands varied from 4½ feet on the lowest to a few inches on the highest. The quantity of water then stored in the basin of the Suck above Pollboy Mill (which is two miles below Ballinasloe) was 1,481 millions cube feet, and it was accumulated in about 14 days, at the average rate of 73,000 cube feet per minute. But for greater accumulations occurred on particular days out of the 14. On the 11th of August, when 1½ inch of rain is registered as having fallen at the Queen's College, Galway; and on the 15th, when a one-inch fall is recorded, great quantities of water must have been stored in the basin of the Suck. If the channels of the Suck and its tributaries had, previous to August 1861, been so improved as to prevent the inundation of the bordering lands, all that 1,481,000,000 cube feet of water would have gone to the Shannon during those 14 days, together with the quantity which did go, and each day from the 9th to the 23rd of August, when the Shannon was highest, a greater quantity would have entered the Shannon from the Suck than actually did enter it. From that day a lesser quantity per day would be supplied by the Suck when improved. If that stored quantity of 1,481,000,000 cube feet, which was gradually accumulated, were suddenly let off by withdrawing or rupturing a barrier, awful consequences would result. If none were stored above, but all let down gradually from the beginning, no such catastrophe could result, because the whole quantity must then have passed off from the basin of the Suck before the 23rd, when the Shannon water was at its highest level, and that highest level of the Shannon in the lower districts could not have been increased by the water stored on the lands bordering the Suck. But the greatest height of the Shannon, instead of occurring on the 23rd, would have occurred some days earlier than it did, and would also have been higher than it was. How much higher the Shannon would have then been had all the waters of the Suck been gradually let down without covering any lands, and on what earlier day the greatest height would have occurred, there does not exist sufficient data to ascertain exactly, but I am able to fix it approximately. In August 1861, the greatest height of water passing over the weir at Meelick was 1 ft. 10 in. on the 23rd and five following days. Had all the water of the Shannon, the Suck, and its tributaries, come down gradually from the beginning of the floods without inundating any lands on either river, the greatest height on that weir would have been on the 17th, or six days earlier than it was, and it would have been 3 inches higher than it was passing over the weir, and six or eight inches higher at the confluence of the two rivers. The quantity of water passing over Meelick Weir on the 23rd August 1861, when the head was 1 ft. 10 in. over the weir, 1,100 feet long, I estimate at 550,000 cube feet per minute, and with the greater head of 3 inches the quantity would be 643,400 cube feet per minute. This is on the supposition that the amount of reservoir available in the lakes under future circumstances would be equal to what it was in August 1861, which it would be, and even greater when properly regulated by the action of the proposed sluice weirs. It is therefore quite safe to take 700,000 cube feet of water per minute as the greatest quantity to be passed off at Meelick in any future autumn flood, when all the lands on the Shannon and Suck will be free from inundation. The River Brosna, entering the Shannon at Shannon Harbour, six miles upwards, has a rain-basin of 389,000 acres, and other streams there entering below it drain 21,000 acres, which together make 410,000 acres, or one-fifth of the rain-basin of the Shannon at Meelick. This reduces the quantity of flood-water to be provided for at Derryholmes to 560,000 cube feet per minute. Such maximum quantities have hitherto lasted no more than six or seven days, and it may be concluded that with the channels and outlets improved as proposed, they will not last more than three or four days, when the quantity passing with unusually wet seasons, such as 1861, will not exceed 530,000 cube feet per minute at Meelick, nor 450,000 at Derryholmes.

The dimensions of the channels shown on the maps and sections at Meelick, Derryholmes, and Bishop's Island, are sufficient to carry the maximum quantities, lasting a few days, six inches under the lowest lands, and to carry the lesser quantities 12 or 15 inches under those lands, and 18 to 24 inches under large

areas. None of the low callows are tilled, nor is it probable they ever will be tilled, and a flood remaining three or four days within four to six inches of the surface of meadows does no damage, though in mowing and making hay the grass would be damaged if the flood-water were within six inches of the surface.

80. The Works necessary for this District are:—

To construct a moveable regulating weir, where there is a suitable site and a good foundation, between Cromwell's Fort and the Ordnance Round Tower, about 1,000 feet below the present weir.

To remove the present weir.

To embank the river from the present weir downwards for 600 yards to the site of the proposed weir by material excavated from its bed.

To widen and deepen the old branch of the river at Kilmessriff Mill to the extent shown on the maps and sections of that place.

To widen and deepen the river channel at Derryholmes to the extent shown on the maps and sections of that place.

To dredge the channel from Keelogue upwards by Shannon Grove, Banagher, Shannon Harbour, Derryholmes, and Bishop's Islands.

In the work of widening the channel, the lower part of the excavation may be cheaply executed by the steam dredgers.

81. The regulating weir will be built so as to maintain with certainty the Parliamentary height of the water in dry summer weather, viz., six feet over the upper sill of Hamilton's Lock. This will be a great improvement for the navigation, as under present circumstances the water falls 6 inches under that level in dry summer weather. A further improvement on the navigation channel will be produced by the great widening of the water-way from the present weir upwards. In the flood of August 1861, the fall in 10,000 feet of that channel was two feet. With the channel improved as here proposed, the fall with an equal quantity of water will be but one foot. To carry off extraordinary autumn floods it will be necessary to widen the present river channel to the extent shown on the map, and to enlarge the channel at Bishop's Islands to the extent shown on the map of that part of the river.

ATHLONE AND TARMONBARRY DISTRICT.

82. From the weir to the canal head	- - - -	1 mile.
From thence to the lake	- - - -	1 "
Length of the lake to Lanesboro'	- - - -	17½ miles.
River from Lanesboro' to Tarmonbarry Weir	- - - -	7½ "

The area of land liable to autumn floods is	- - -	1,164½ acres.
The additional area liable to winter floods is	- - -	1,666½ "
The additional area liable to saturation is	- - -	562 "

Total area of land injured by the Shannon	- - -	3,393 acres.
In this level	- - -	

The estimated increase in the value of these lands is, 595 l. 18 s. 3 d.

The area of Lough Ree and the approaching rivers is, 27,000 acres.

83. The height of the surface of the lough for navigation is 7 feet over the upper sill of the new lock at Athlone, 6 feet over the lower sill of the new lock at Tarmonbarry, and 5 feet over the lower sill of the old lock of Cloondra; but in consequence of the water used at the Athlone Mill, and the leakage through the Athlone Weir, the surface of the lough falls three inches lower in dry summer weather. The flood of August 1861 was 12 days rising from the level of the general surface of the land 1 ft. 8 in. The greatest rise in 24 hours was 3 inches.

84. The

84. The falls of the surface of the water were then as follows:—

From Tarmon Weir to Lanesboro', 1 ft. 9 in. in 7 miles, or 3 inches per mile.

Thence, to the lower end of Lough Ree, no appreciable fall in calm weather.

Thence to the head of the canal - - 3 inches in 1 mile.

Thence to the weir wall - - - 6 " in 1 "

Fall over the weir wall - - - 5 inches.

The back water below the weir was 1 ft. 10 in. higher than the weir crest. When the lower division of the river will have been improved by the excavations at Bishop's Island, Derryholmes, and Meelick, the back water below Athlone Weir will be lowered three feet in floods. Then the water just above the weir may be also lowered three feet, that is, from 9 ft. 3 in., what it was on the upper sill in August 1861, to 6 ft. 3 in., which will be sufficiently deep for navigation.

The flooded river, two miles long from Lough Ree to the Athlone Weir, will then have a surface fall of about 15 inches, so that the surface of that lough will be 7½ feet higher than the upper sill of Athlone Lock, which is a foot under the lowest land. The current in the sailing course from the weir to the lake will be increased during high floods, but not to a degree that would cause any serious difficulty for the steam vessels to go up against it. In small floods and in low water, there would not be any increase of current. It is important to bear in mind that at present the trade on the Shannon above Athlone is very small. One steambast a month does it all. The passing up of a steam-vessel is a remarkable occurrence. There can be, therefore, no difficulty in closing the sluices during the passage of a steamer from the weir to Lough Ree, a distance of two miles, and thus reduce the current to a lesser velocity even than heretofore. No inconvenience could occur to steamers in sailing down.

IMPROVEMENTS.

85. I therefore propose to construct a regulating weir composed of moveable flood-valves, instead of the present weir wall at Athlone, and to adjust it so that it will maintain the level of Lough Ree at the same height as hitherto in driest summer weather, viz., 6 ft. 9 in. over the upper sill of Athlone new lock, and let off the flood waters in autumn, so as to keep the surface of the lake down to 7½ feet, or 8 feet. The surface fall of the river from Tarmonbarry Weir to Lanesboro', seven miles, was, in August 1861, 1 ft. 7 in. except during three stormy days, when it was three inches more. If the surface of the flood water be kept down to nine feet on the lower sill of Tarmonbarry Lock, a few acres only of the very lowest margins of lands will be injured; and as that sill is a foot higher than the upper sill of Athlone Lock, there will be then a fall of 2½ feet for the surface of the river from Tarmon to Lanesboro', 7½ miles. There are five rather narrow and shallow parts in this distance, being but about 300 feet broad, and amounting together to less than a mile in length. The other six miles of the river channel are generally 500 feet broad, and 10 to 17 feet deep. The lowest summer level of Lough Ree, 6 ft. 9 in. on the upper sill of Athlone new lock, is 1 ft. 9 in. under the general surface of the low lands, and that depth over the 27,000 acres of water is 2,000 millions cube feet. This immense reservoir may, by means of the regulating weir, be kept available in ordinary wet weather, and ready to receive and retain the influx from great floods. It would be capable of retaining one-fourth of the great flood of August 1861, while three-fourths would be passing off for 10 days. These double effects of the regulating weir in keeping down the surface of the great lake in ordinary wet weather, and in letting off the surplus of great floods, are, in my opinion, sufficient to prevent autumn inundations in this division without expensive excavations above Lanesboro'.

TARMONBARRY AND ROOSKY DISTRICT (7½ Miles).

86. From Tarmonbarry Weir to Lough Forbes	-	-	-	2½ miles.
Lough Forbes	-	-	-	2 "
From Lough Forbes to Roosky Weir	-	-	-	3 "

The area of land liable to autumn inundations is - - 786 acres.

No additional land is liable to winter floods.

The additional area saturated every winter is - - 82 „

Total area injured by floods in this level - - 868 acres.

The estimated increase in the annual value of these lands by drainage is - - -	£.	s.	d.
	176	15	3

The estimated cost of the proposed works of drainage to carry off ordinary floods is -	1,890	-	-
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To carry off extraordinary autumn floods -	6,350	-	-
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87. The features of this district differ from those of all the others

A branch stream leaves the Shannon at the lower end of Lough Forbes, and after having been joined by two tributaries, re-enters the Shannon three miles downwards. On this branch the greater part of the flooded land of the district lies. The fall on this branch on the 17th December 1866, when the land was all flooded, was 5½ feet, of which 4 ft. 2 in. were occupied by the Clondra flour mill, and 1 ft. 4 in. in bends and rapids below the mill.

IMPROVEMENT WORKS PROPOSED

88. It is necessary to keep the surface of Lough Forbes in autumn floods down to seven feet over the upper sill of Tarmon Lock. The fall of the river surface from the lake to the weir, 2½ miles, would be 2½ feet, which would leave the water but 4½ feet deep on the upper sill of Tarmon Lock. When the regulating weir will be in action at Athlone, the autumn flood water will not rise above nine feet on the lower sill of Tarmon Lock, and as the rise of the lock is 8 ft. 7 in., this will give a fall of four feet for the water there. The quantity of water passing in the highest time of the flood of August 1861 was 346,644 cube feet per minute. Flood valves extending 100 feet across the river will let off that quantity with 4½ feet depth and four feet fall. Not more than one passage in a month is made by steamers upwards, and one downwards, in this part of the Shannon. The sluices or great part of them may be closed when a steamer enters Tarmon Lock, and left shut for an hour till she will have passed upwards clear of the current. The lockkeeper may easily learn what day the steamer will return, and he may close the sluices on the morning of that day, and leave them shut till the vessel will have passed through the Tarmon Lock. The sluices may then be opened and left so for a month. This process will have to be repeated but three or four times during the three autumn months, even if a high flood should remain during that time. If this arrangement be objected to, it may be stated in reply as follows:—

89. First,—It is not reasonable to keep an artificial barrier such as the weir-wall across the river, which raises the water more than five feet, and inundates a large area of land for a whole month, to allow one only steam vessel to pass once up with 40 tons of flour, and once down empty.

Second.—That part of the river is not the legal channel for navigation. The legal channel for navigation as recommended by the Shannon Commissioners, delineated on their maps, and sanctioned by the Act of Parliament, is through the old canal and lock of Clondra, and thence by the Camlin River to Lough Forbes. The old lock and canal will have seven feet of water under the proposed arrangement, and thus the communication between the Shannon and the Royal Canal at Richmond Harbour will remain undisturbed. The old sailing course from the Royal Canal by the Camlin River upwards to Lough Forbes, will

will be made better than it has hitherto been, as it will be cleaned and its banks trimmed, and the shallow parts deepened as described. It is a curious fact that a great part of the trade is still carried on by this channel, rather than by the improved channel in the main river. I saw large boats laden with merchandise from Dublin to Rosky taken up that way last December.

90. The change of the navigation channel from the legal line through the old lock of Cleendra to the River Shannon at this place, was made without any authority or sanction from Parliament or from the Lords of the Treasury.

THE DISTRICT FROM ROSKY TO JAMESTOWN (11½ Miles).

viz, 5½ miles of lough and 5½ miles of river.

91. The area of land liable to autumnal inundations is	-	1,162 acres.
The additional area liable to winter floods is	-	5 "
The additional area saturated is	-	278 "
Total area injured by the Shannon in this level		1,445 acres.

The estimated increase in the annual value of the land is	£.	s.	d.
	-	277	10 11

This includes the flooded lands bordering the Carnadoe lakes.

The estimated cost of the necessary works for drainage is, to carry off ordinary floods	-	3,200	-	-
To carry off extraordinary autumn floods	-	4,500	-	-

92. The level of the water for navigation is six feet on the upper sill of the new lock at Rosky, and the same on the lower sill of the new lock at Jamestown.

The flood of August 1861 rose 2 ft. 2 in. higher at Rosky Lock, and three feet higher at Jamestown Lock. The falls of the surface of the water then were—

From Jamestown Lock to the head of the canal at Rosky, four inches in 10 miles, or less than half an inch a mile, and five inches from the canal head to the weir wall, seven furlongs. The fall over the weir wall was 12 inches. Very little land was covered more than one foot deep with water, so that if the surface of future autumn floods be kept down 18 inches under the level of the flood of August 1861, the crops will be safe. A weir of flood valves constructed in place of the present weir wall at Rosky, with some dredging in the channel, will accomplish this, when the level of flood water below the weir will have been reduced by the flood valves at Tarmonbarry. The area of the lakes of this district, 4,500 acres, will be available as a reservoir.

94. The passage of the flood water over the present weir wall is much obstructed by a fish weir a few feet from it on the down-stream side. The fish weir is composed of stakes and hurdles made close, and it prevents the flood water from passing away from the tail of the weir, making what is called a submerged or drowned weir, and raising the water over the meadows for several miles up stream. That fish weir was built under the authority of the Commissioners of Public Works, who have let the fishing of it on lease for 20*l.* a year. It is an injury to the lands, and a cause of irritation to the occupiers, who think it a great grievance to see the Commissioners receiving a rent for a fish weir which contributes to the destruction of their crops.

I beg to suggest that this fish weir be immediately removed.

THE DISTRICT FROM JAMESTOWN TO BATTLEBRIDGE (11½ Miles).

3½ miles of lakes and eight miles of river, nearly all of which is broad and deep.

95. The area of land liable to autumn and winter floods is	-	1,124 acres.
The additional area saturated is	-	269 "
The estimated increase in the annual value of the lands by drainage is	-	£ 334 9 s.

96. The navigation level of the water is six feet on the upper sill of Jamestown Lock, and the same on the lower sill of Battlebridge Lock, but the floods of August 1861 rose 4 ft. 3 in. higher at Battlebridge, and 2 ft. 10 in. higher at Jamestown Canal.

The falls of the surface of the water were then as follows:—

From Battlebridge Lock to Carrick on Shannon, nine inches in 5½ miles, or 1·63 inch per mile.

From Carrick on Shannon to the head of Jamestown Canal, eight inches in five miles, or 1·60 inch per mile.

Thence to the weir wall 17 inches in half a mile, or 34 inches per mile.

Fall over the weir wall, 12 inches.

Evidently the obstructions are, the weir wall, and the crooked narrow channel from Jamestown Bridge to the weir wall.

97. I propose to construct a weir of flood gates, instead of the present weir wall, and to widen and clean the river channel to the extent shown on the plan and sections of the river at that place. I propose to construct the new weir across the river just below the present weir. In summer it will be quite easy to enclose each half of the channel alternately there, and keep it dry while constructing the weir. In high floods the weir must be all open, and then its piers will be very little more obstruction in any one part of the river than another. If it were built above the bridge, the river would be very shallow between the two demesnes of Jamestown and Charlestown, which would injure the appearance of both, but by constructing it close to the present weir there will be deep water between the two demesnes all the year, and in widening the channel the sheet of water will be increased, and the now unsightly low wet margins will be either cut away or raised, and the appearance of both demesnes will be improved. The mill power will be preserved.

THE DISTRICT FROM BATTLEBRIDGE TO LOUGH ALLEN.

Length 5½ miles of river, with a fall of 22 feet.

98. The area of land frequently flooded in autumn, spring, and winter is	-	-	-	-	-	-	509½ acres
The additional area saturated is	-	-	-	-	-	-	89 "

Total area of land injured by the Shannon in this level 598½ acres.

	£.	s.	d.
The estimated increase in the value of the land is	-	203	8
The estimated cost of the necessary works of drainage is	4,143	-	-

This does not include any lands on the River Feorish above the Shannon level.

99. The navigation does not interfere here, and the whole of the natural fall of the river may be used for drainage. The great obstruction is a rock across the River Channel at Drumhariff, and that obstruction is much increased by a bridge built on the highest part of the rock shoal. That bridge is composed of nine piers, each five feet thick, and 10 open, 8 to 10 feet broad, covered with timber, sods, and gravel, so that one-third of the water-way is occupied by the piers, and this together with the bad shape of the piers so obstructs the passage of floods, as to keep the water on the upper side two feet higher than the water on the down-stream side of the bridge. A channel through the rock shoal may be excavated without any pumping, as there is a fall of nine feet in a distance of half a mile, and the river bed is from 120 to 220 feet broad.

100. This channel is to be 60 feet broad and six feet deep at the crest of the shoal, as shown on the map of that place, and spanned by an iron girder bridge. This will leave the bridge in a far better condition for public traffic than it has hitherto been; but it will still be a very bad roadway, as the approaches are very steep. If the counties of Leitrim and Roscommon resolve to construct a proper bridge on a better site, where good approaches may be made, the proposed bridge may be modified to suit any other approved design.

101. The

101. The bed of the channel from Drumheriff upwards is nearly all either mud or sand, which will be easily cleared out, when the shoal will have been cut through. The foundations of the bridge at Gallagh are very bad, and would cause great expense if the channel were deepened there and upwards. To avoid touching that bridge, I propose to trim the now irregular banks of the river from Gallagh Bridge upwards to Lough Allen, 1,100 yards, and clean the channel, and to form the stuff so got, into low flat embankments on both sides of the river, and to continue the embankment for 600 yards by Lough Allen which will protect all the low lands between the bridge and the lough from floods. To carry off the surplus rain-water, &c., there is already an excellent back-drain on the Roscommon side. A back-drain must be made on the Leitrim side, between the high and the low lands, from the old mill for 900 yards downwards.

The lands injured by the Shannon between Drumheriff rocks and Inchanagowil rocks, 67 acres, may be drained by cutting a channel through the Inchanagowil rock to the breadth and depth shown on the map and sections of the river at that place.

102. Just above Battlebridge there are 17 acres of land flooded in autumn, and 53 acres saturated. When the flood-waters will have been regulated below Battlebridge by the proposed works at Jamestown, these 53 acres will be relieved from saturation, and the 17 acres from autumn floods; but they will not be completely drained in consequence of the obstruction caused by the shoal under Battlebridge. They may be completely drained by cleaning out the channels of the streams (which enter from the high lands), and forming the stuff taken out into broad low embankments, and by making a similar embankment by the Shannon. The rain-water and springs may be carried off by the existing canal back-drain, to within 300 yards of Battlebridge, and thence by a pipe laid in the tail of the canal bank downwards to the tail of the lock, whence it will pass into the Shannon at a sufficiently low level. Length of pipe required 600 yards.

THE DISTRICT AROUND LOUGH ALLEN.

103. The area of land subject to autumn and winter inundations is	-	-	-	-	-	285 acres.
The area saturated is	-	-	-	-	-	46 "
The estimated increase in the annual value of these lands by drainage is	-	-	-	-	-	89 l. 13s.

104. The area of Lough Allen is 8,852 acres.

There is no navigation for trade on Lough Allen. The old canal, $4\frac{1}{2}$ miles long, joining it with the Shannon, is too shallow, and a lock on it at Drumkeage is too small to pass any of the trade boats used on the Shannon. The floods rise $3\frac{1}{2}$ feet over the summer level, which makes a reservoir of 1,384 millions cube feet.

105. This immense natural reservoir greatly diminishes the quantity of flood-water in the river downwards at the beginning of floods, and as the area of land to be improved by regulating the water of the lake is so small, I propose to leave it as it has hitherto been.

106. The district from the lough downwards will be easier drained.

THE DISTRICT FROM LIMERICK TO CASTLECONNEL (8 miles).

107. Your Lordships have exempted the district between Limerick and Castleconnel from this engineering survey.

CONCLUSION.

108. It will probably appear very strange to your Lordships that the drainage part of the Shannon Improvement Undertaking, as provided for by the Legislature, has so far failed that 16,299 acres of land are still inundated every year, that the crops of that area are every autumn at the mercy of the elements, and that a sum of 92,597 l. is still necessary for works to relieve these lands from

ordinary autumn floods. The causes of this signal failure are as follows. First ; very large portions of the excavations of the river channel, as delineated on the Parliamentary Plans, still remain to be executed at Limerick, Killaloe, Meelick, Athlone, Tarmunbarry, Roosky, Drumberriff, Bealantra, &c. This abandonment of the works in an unfinished state was not altogether for want of funds, for a large sum of money was invested in the purchase of fisheries, lands, and mills, which were not necessary for either drainage or navigation, and which have been for many years let at rents amounting to more than 1,000 *l.* a-year. The amount of money so invested, with interest for the last 20 years, would pay the cost of completing a large portion of the unfinished excavations.

109. Second : the Killaloe weir-wall was raised 12 inches higher than was necessary for the minimum level of the surface of Lough Derg delineated on the Parliamentary Plan ; and the sites of other weirs were changed to places more unfavourable for the drainage than the sites authorised.

110. Third : one of the leading principles on which the system of drainage was founded, though apparently correct in science, was absolutely wrong in practice, viz., making the weirs without sluices, on the idea that the great length given to them by running them obliquely like a half horseshoe down the river would compensate for the want of sluices. In the reasoning which led to this conclusion an important element was omitted, viz., the influence of a narrow channel immediately above the weir. Colonel Sir J. F. Burgoyne expressed a doubt of the efficiency of long weir walls without sluices, in a letter to Sir John Cam Hobhouse in 1832, and added that sluices or filling boards should perhaps be placed in such weirs, but the weirs were subsequently built across the Shannon without any sluice or floodgate in any one of them. Four of these weirs must now be wholly, and two others partly removed, and weirs composed altogether of floodgates must be constructed in order that no part of the natural fall of the river shall be wasted in cataraets at particular places when required to impel the stream. This involves an expense of 20,000 *l.*, which would not be required if proper regulating weirs had been at first constructed.

111. Fourth : the drainage portion of the undertaking was sacrificed in favour of the navigation. If for want of funds it became necessary to omit portions of the work ordered by Parliament to be executed, and an application had been made to Her Majesty's Government to decide whether portions of the drainage works or portions of the navigation works should be omitted, and if the matter had been well considered, it would most probably have been ordered that the drainage works should be completed and portions of the navigation works omitted ; because the old locks and canals at Athlone, Tarmunbarry, Roosky, and Jamestown would, with a moderate outlay for repairs and improvements, have been quite sufficient for all the trade then or since, or likely to be on those portions of the river. One steamboat once a month does all the trade there. Thus many thousand pounds might have been appropriated to complete the excavations for drainage as first designed. The works of drainage, if completed, would be worth 6,000 *l.* a year. The works for navigation have not only yielded no return whatever, but the subsequent maintenance of the navigation has cost the public purse more than 1,000 *l.* a year every year since 1850, as appears from the annual returns furnished by the Board of Works.

112. The drainage part of the undertaking would be completed, and the crops on 16,299 acres of land would be secured against destructive inundations if the works had been designed and executed according to the spirit of the instructions on this subject, contained in the letter written to Colonel Burgoyne, Chairman of the Board of Works, in 1831, by the Chief Secretary of Ireland, then Lord Stanley, now the Earl of Derby, as follows : " It is thought desirable by the Government that your inquiries should take a wider range, and should take within their scope the benefits which might be expected to result from a judicious expenditure of capital upon the River Shannon, both with reference to the improvement of its navigation, and also to the reclaiming of vast tracts of land now either inundated periodically by the floods of that river and its tributary streams, or rendered permanently incapable of cultivation from the accumulation of waters which are unable to find a vent, &c."

113. Another

SHANNON AND SUCK RIVERS.

113. Another cause which increases the cost of the necessary works is, that 23 of the rivers tributary to the Shannon have been improved under the Arterial Drainage Acts. The area of land drained by them is 1,690,000 acres, and all the water which formerly spread out over the many thousands of acres of land flooded by those rivers now comes down direct into the Shannon Valley. No improvement whatever has been made in the outlets of the Shannon to compensate for this great additional influx of flood-water.

I have, &c.

(signed) *James Lygon*, C. E.

SHANNON AND SUCK RIVERS.

R E P O R T

OF

MR. J. LYNAM

OF THE

RIVERS SHANNON AND SUCK.

(*Mr. Hunt.*)

*Ordered by The House of Commons, in the Fifth
15 May 1807.*

238.

Entered 3 02.